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chemistry. A fellow in biology will also be appointed.

THE University of Utrecht will celebrate this year its 260th anniversary, the *fêtes* beginning on June 22d. The many American students and professors going abroad during the summer will find this a favorable opportunity to visit Utrecht.

THE late Mrs. Nichol, of Edinburgh, has bequeathed \$10,000 to Edinburgh University, to found a scholarship in physics.

PROF. J. PERRY has been appointed to the vacant chair of mechanics and mathematics at the Royal College of Science, London.

THE University of Edinburgh has conferred the degree of LL. D., on President F. A. Walker, of the Massachusetts Institute of Technology.

THE Senate of Glasgow University has conferred the degree of LL. D., on Prof. Thiselton-Dyer and on Prof. Andrew Gray.

DR. ALBERT FLEISCHMANN has been promoted to an assistant professorship in the University of Erlangen and has been appointed director of the Zoölogical Institute. Dr. George Rörig, of the Agricultural High School at Berlin, has been appointed assistant professor of zoölogy in the University of Königsberg.

DISCUSSION AND CORRESPONDENCE.

THE MATERIAL AND THE EFFICIENT CAUSES OF EVOLUTION.

PROFESSOR BROOKS states in the last number of this journal that he is glad to find that after much irrelevant discussion one reader (M. M., *SCIENCE*, Apr. 3d) has found the thesis of his article on *Science and Poetry* (*SCIENCE*, Oct. 4, 1895) worthy of serious consideration. Now it seems to me on the contrary that M. M. does not discuss Professor Brooks' views, but simply points out the ambiguity of his phrase 'test of truth.'

I should suppose that no one outside of a madhouse would dispute Professor Brooks' view that conceivability is not a sufficient test of truth. Whether or not conceivability is a necessary condition of truth depends somewhat on what is meant by 'conceivability,' which

is a comparatively new word, and is used by Professor Brooks with some latitude. If it be inconceivable to him that the image on the retina is inverted, then of course conceivability is not for him a necessary condition of truth. Whether or not a proposition which would commonly be regarded as inconceivable—as that a straight line may enclose an area—could in a special case be proved true by evidence, and if so whether the proposition would continue to be inconceivable, are questions which M. M. does not discuss.

At the risk of again being accused of irrelevancy by Professor Brooks, neither shall I discuss these questions, but wish to make clear a distinction analogous to that pointed out by M. M. In discussions on the theory of evolution we find Neo-Darwinians saying that 'natural selection' is the cause of the origin of species, and Neo-Lamarckians saying that the environment and the movements of the animal are the causes of adaptations. Now in these cases the word 'cause' is used ambiguously, ignorance of the facts of evolution being concealed by the exhibition of ignorance of logic.

I wonder how many men of science have read Aristotle, or understand his distinctions between material, efficient, formal and final causes. We are not here concerned with a formal cause, the idea or plan of a thing, nor with a final cause, the end for which it is made; but no student of organic evolution can afford to ignore the distinction between material and efficient causes, or between the occasion and the efficient cause of an event. The material cause is that of which a thing is made, one of the occasions or necessary conditions of its existence; the efficient cause is that which produces a thing and makes it what it is. When no qualification is used *cause* should mean efficient cause or *vera causa*.

'Natural selection' is no cause of the origin of species, but may be the cause of the annihilation of unfit species. Whether or not the environment, or consciousness, or the movements of animals are causes of hereditary modifications are open questions. What is called the cause of an adaptation is, however, usually only its occasion. Thus at a recent meeting of the

New York Academy of Sciences Prof. Osborn, in arguing that the environment is one of the causes of adaptations, stated that lime is the cause of teeth, because teeth depend on the existence of lime and vary with its abundance. It is true that there could be no teeth if there were no lime, but teeth do not result from the mere presence of lime in the environment. Lime is one of the material causes and occasions of teeth, but it has not been shown that it is their efficient cause. It would seem that the environment is more often the cause of the destruction of life than the cause of its development.

J. McKEEN CATTELL.

COLUMBIA UNIVERSITY.

INSTINCT.

IN Prof. Mills' communications on 'Instinct' he seems to have missed the point in the case of each of those criticised—the 'writer of the note,' Prof. Morgan and myself. In the case of the fowl's drinking, it is not the mere fact that drinking and eating may differ in the degree to which the performance is congenital; the reports seem to show that this varies in different fowl; but that instincts (in this case drinking) may be only half congenital, and may have to be supplemented by imitation, accident, intelligence, instruction, etc., in order to act, even when the actions are so necessary to life that the creature would certainly die if the function were not performed. That is the interesting point.

Then, in criticising me, Prof. Mills accuses me of ignoring the 'effects of environment and of use.' On the contrary, these are just the facts which I appeal to. By adaptations to the environment and by use the creature manages to keep alive; other creatures die off; so certain determinate directions of congenital variation are singled out and inherited. Thus phylogenetic variations become determinate, just through these ontogenetic adaptations. This takes the place of the Lamarckian factor. Lamarckism is an 'obvious' resort in all cases, of course, but it seems to me so easy that in many cases it is shallow in the extreme.

But my view is very far from being Weismannism. I reach determinate variations by means of new functions or adaptations which

keep certain animals alive to propagate. It is really a new theory, as Prof. Osborn, who has reached about the same point of view, declares. This is also just the value which Prof. Morgan attaches to his observations.

J. MARK BALDWIN.

PRINCETON, April 17, 1896.

STUDIES IN THE MORAL DEVELOPMENT OF CHILDREN.

The Relation of the Child to Authority.

IT is desired to obtain data for a study of the attitude of young children toward parental authority, with a view to determining what sort of discipline, instruction and appeal is best calculated to develop in children a proper recognition of the parent's authority and a readiness to submit to it.

Parents who are willing to aid in the investigation are requested to carry out the following experiments, and to report the results.

1. Try different punishments for the same offence, as follows:

(a) *For Naughtiness at Table*: (1) Corporal punishment, though not necessarily severe. (2) Sending the child away from the table, with permission to return as soon as he is ready to be good. (3) Having the child eat by himself in the kitchen.

(b) *For Sauciness to Parents*: (1) Corporal punishment. (2) Sending the child into the bedroom to stay till he is ready to take back what he said. (3) Refusing to caress the child or to be caressed by him until he is ready to make up and say he is sorry. Of course, it may sometimes be hours after the offence before occasion is given for applying this last penalty, the parent meanwhile seeming to have ignored the offence. If the child has not made up before bedtime, then put him to bed without his usual kiss, explaining why you do so.

(c) *For Taking a Toy Belonging to a Playmate* (whether by force or stealth), with a resulting outcry on the part of the playmate: (1) Compelling the child by corporal punishment, or the threat of it, to return the toy to the playmate. (2) Taking the toy away by force and returning it to the playmate, and sending the child into the bedroom for five minutes. (3) Giving one of the child's favorite toys (not